

of these are insulin resistant and two are insulin sensitive. Seven patients have coronary sclerosis, and five of these have had definite attacks of angina. Four patients have had at least one cerebral hemorrhage. All of these patients except three have a severe degree of diabetes, and the three are of moderate severity. All have held a good control after the first period of adjustment except three, and these remain as difficult problems with P-I as they were on former R-I therapy. Three deaths have occurred in the entire group of 150 patients during the months of P-I study, and these all belonged in this arteriosclerotic group: one death from myocarditis, one from coronary thrombus, and one from advanced cerebral sclerosis. It is realized that no definite conclusion can be based on results of a study carried through for so short a time; but it is our impression that those patients of this group with anginal pain have had less frequent attacks, and that the pain has been less severe.

PROTAMIN INSULIN IN PRE- AND POSTOPERATIVE CARE

Experience with protamin insulin in pre- and postoperative care has been too limited for definite conclusions. With the few surgical patients for whom protamin insulin has been used, the maintenance of diabetic control after prolonged anesthesia has been very satisfactory. Only three cases have been observed and these are moderately severe diabetics. One patient received a single dose of ZP-I at the time of a midnight feeding, with early morning surgery following. Two received a single dose six hours before operation. All were adults and held full diabetic control after surgery for twenty-four hours without additional insulin.

SUMMARY

It is realized that conclusions on the results of protamin insulin treatment must be based on observations of less than one year. Also, some considerable part of the improvement here recorded might have been obtained with regular insulin therapy if the same close observation were followed, with the better degree of coöperation that could have resulted.

In the entire group of 150 diabetic patients now reported, the attempt in these studies has been to substitute one or two daily doses of protamin insulin for any number of doses of regular insulin that had been taken before, without making any change in the diet values or in the arrangement of meals in any way, except the addition of a night feeding when this had not been taken previously.

The entire group of patients included in this study have been problem cases, and were selected for this study because of the difficulties in maintaining satisfactory diabetic control with regular insulin.

Even in the mild and moderately severe diabetic patients, protamin insulin can give satisfactory results only when the problems of technique are approached as individual problems for each patient. As great a difference in individual absorption rate will be found in the mild as in the most severe patient.

In deciding the unit dose of protamin insulin, it must be kept in mind that the insulin has a U-40 strength. To secure the full unit dose prescribed it is necessary that the bottle be gently shaken in order to have an even distribution of the sediment, which contains an important part of the insulin dose.

Early morning hypoglycemic reactions are often due to an overlapping insulin effect, insulin from the injection of the previous morning and from the evening being actively absorbed at the same time. At the beginning of protamin insulin treatment, reaction symptoms may appear at irregular times during the day and night. These may be due to conditions of adjustment to the slow and gradual absorption of insulin, and appear to be more disturbing in those patients who have used regular insulin for several years. Close observation of these patients during their period of adjustment is important.

The recognition of patients who are classed either as insulin sensitive or as insulin resistant is important. The insulin sensitive patient appears to become more completely adjusted to a slow absorption of insulin and more able to maintain a diabetic control on one daily dose. In the 150 diabetic patients, over 56 per cent of the insulin sensitive group have been able to continue on one daily dose of the protamin insulin, as compared with 29 per cent among the insulin resistant cases.

1930 Wilshire Boulevard.

REFERENCES

1. Smith, B.: *Calif. and West. Med.*, 45:450, 1936.
2. Falta, W.: *Verhandl. d. Gesellsch. f. Verdauungs u. Stoffwechselk.*, Vol. 11 (Oct.), 1932.
3. MacBryde, C. M.: *J. Clin. Investigation*, 15:577, 1936.
4. Umber, F.: *Deutsche med. Wchnschr.*, 62:1197, 1936.
5. Rabinowitch, I. M., Fowler, A. F., and Corcoran, A. C.: *Canad. M. A. J.*, 35:124, 1936.

CARDIOSPASM*

By H. BRODIE STEPHENS, M.D.
San Francisco

DISCUSSION by F. P. O'Hara, M.D., San Diego; John Hunt Shephard, M.D., San Jose.

CARDIOSPASM is the term used to describe that clinical condition characterized by a difficulty in swallowing, caused by an obstruction at the lower end of the esophagus in the region of the diaphragm. Despite the severity of the obstruction observed during life, though dilatation and hypertrophy of the esophagus are still present at necropsy, no obstruction can be found distal to the dilatation. Whatever the cause of obstruction during life, it ceases to act after death.

SUGGESTED HYPOTHESES

Many hypotheses have been suggested to account for the obstruction. These can be con-

* From the department of surgery, division of thoracic surgery, University of California Medical School, San Francisco.

Read before the General Surgery Section of the California Medical Association at the sixty-fifth annual session, Coronado, May 25 to 28, 1936.

TABLE 1.—On Ten Patients With Cardiospasm*

Initials	Age	Sex	Symptoms and Duration	Treatment		Results	
				Type	Number	Symptomatic	X-ray Appearance
I. C.	29	F.	Vomiting after eating, eight years.	Plummer dilatation, July to December, 1931	Several	Weight: 53.8 kilograms, 1931 Weight: 74.5 kilograms, 1935 No complaints, 1935	Dilatation with angulation in 1935; only dilatation in 1931.
P. G.	39	M.	Thought to have a carcinoma; considerable weight loss, several months.	Plummer dilatations, September, 1934 July, 1935	4 5	Weight: 66 kilograms, 1934 Weight: 84.6 kilograms, 1935 No complaints	Dilatation of esophagus and spasm still present; slightly less than before treatment.
L. F.	60	F.	Difficulty in swallowing food, three years. Peptic ulcer, 1927, cured medically.	Esophagoscopy and bougie dilatations, July, 1933	4	Weight stationary. Very few symptoms, improved by esophagoscopy, inadequately treated. Esophagoscope entered stomach easily in January, 1936.	Progressive increase in size of esophageal dilatation.
N. G.	33	M.	Recurrent attacks of vomiting, three years.	Esophagoscopy and Plummer dilatations, September, 1933 October, 1933	5 2	Weight stationary. Fifty per cent improved two years after treatment.	Marked dilatation of esophagus before treatment. Slight improvement after five dilatations. Good case for operation, but patient refused.
R. B.	40	M.	Burning pain under the sternum, and loading up of food in the esophagus, relieved by vomiting, two years.	Esophagoscopy and Plummer dilatations, July, 1935 December, 1935 January, 1936	5 2 1	Twelve pounds gain in six months. Eating everything after eighth dilatation. Result: good.	Moderate improvement; question of duration, however.
R. D.	27	M.	Vomiting after eating, two years. Thirty pounds loss of weight.	Esophagoscopy and Plummer dilatations, January, 1933 February, 1933	2 1	Ten pounds gained in two years. Paroxysmal attacks of difficulty in swallowing. Result: good.	Esophagus dilated three times normal size two years after incomplete treatment. Symptoms paroxysmal. Treated in psychiatric clinic.
M. R.	28	F.	Difficulty in swallowing, eleven years. Tube-fed for two years.	Esophagoscopy and Plummer dilatation; local application 25 per cent silver to ulcer at cardio-esophageal junction. March to August, 1932 January to February, 1933	8 2	Forty pounds gained in two years. No difficulty in swallowing. Clinical result excellent.	One year after dilatations instituted, x-ray shows esophagus much less dilated. Slight spasm with slight delay.
A. P.	42	M.	Difficulty in swallowing solid foods, four years.	Esophagoscopy and Plummer dilatations, October 8, 1932, to March 18, 1933	26	Twenty pounds gain in three years. No symptoms except for delay when excited or angry. Clinical result excellent.	Very slight delay three years after treatment. No dilatation of proximal esophagus. Good x-ray result.
A. E.	47	M.	Vomiting after meals, six months. Loss of weight, 35 pounds.	Esophagoscopy. Dilatations	None	Sixteen pounds gain in three months. Marked improvement by one esophagoscopy.	Esophagus dilated twice normal size. No change after esophagoscopy.
H. W.	56	M.	Regurgitation of food recently eaten, four years.	Esophagoscopy and Plummer dilatations, October 27, 1935, to November 19, 1935	9	Six pounds gain in three months. Clinically much improved.	After nine dilatations, esophagus still markedly dilated.

* Summary of Table 1: Number of males, 7; number of females, 3; ages, 27 to 60 years. Duration of symptoms, several months to 11 years. Clinical results, all improved clinically. X-ray appearance: Two showed decrease in size of esophagus by x-ray; eight were the same or worse.

veniently considered according to whether they postulate changes in the esophagus itself or in adjacent structures. In the latter group are included those cases possibly caused by kinking of the esophagus because of a deformity of the esophageal groove on the posterior surface of the liver (Mosher¹); an incoördination of the normal movement of the diaphragm during deglutition, with perhaps an actual spasm of the diaphragm (Jackson²); obstruction resulting from the action of the phrenico-esophageal membrane (Fulde³).

Hypotheses based upon changes occurring primarily in the esophagus center chiefly upon incoördination of the nervous mechanism of the cardia. Hurst⁴ assumes that there is a paralysis of the mechanism of the vagal opening. In Walton's⁵ opinion there is no paralysis, but rather a spasm in the region of the cardia. The difference in their views is well illustrated in relation to the passage of bougies. Hurst declares that a bougie will always pass the sphincter readily, without resistance; Walton, that the bougie is firmly gripped by the sphincter in its passage. It has been my experience that either bougie or esophagoscope will always pass through into the stomach readily. If either of these views is correct, there must exist at the cardia a true intrinsic sphincter, the tonus of which may be modified by the action of the extrinsic nerves.

KNIGHT'S STUDIES

Knight,⁶ working upon cats because the esophageal structure corresponds most closely to that of the human being, demonstrated that the interdiaphragmatic and intra-abdominal portions of the esophagus function as a true intrinsic sphincter, which is relaxed by the vagus nerve and contracts on sympathetic stimulation. The sympathetic supply arises from the celiac plexus in fibers that follow the course of the left gastric artery and its esophageal branch to the lower end of the esophagus. Knight was able to show definitely that bilateral vagal section reproduced the roentgen, pathologic, and clinical picture of achalasia of the cardia. The sphincter failed to relax. (Ferguson⁷ obtained similar results in monkeys while studying the effects of vagotomy on the gastric function.) If, however, celiac sympathectomy with a consequent denervation of the sympathetic fibers was performed at the same time that the vagi were divided, no obstruction resulted at the cardia; the sphincter always relaxed to allow the meal to enter the stomach. Knight concluded that whether the obstruction was caused by failure of the vagus or by spasm, in either case the integrity of the sympathetic supply is necessary for the obstruction to occur, and therefore it could be relieved by sympathectomy.

CELIAC SYMPATHECTOMY

At the time of Knight's report (January, 1935), seven patients had been subjected to the operation of celiac sympathectomy for the cure of cardiospasm. It was then too early for a complete report of the follow-up studies.

Accurate follow-up studies of the cases of cardiospasm treated by various means of dilatation are infrequently found in the literature. Knight's chart of sixty-six collected cases is surprising because of the high number of failures resulting from treatment by the various forms of dilators.

Knight's findings are substantiated by our study of ten patients, so far as the x-ray studies after dilatation are concerned (Table 1). The most noteworthy observation in these patients studied in our clinic is the marked symptomatic improvement, accompanied by gain in weight immediately following the institution of dilatation, by the Plummer dilator. Before undergoing this treatment the patients were observed both by the fluoroscope and the esophagoscope.

All of our patients were so much improved symptomatically following one or several dilatations that none of them was sufficiently uncomfortable to desire operative treatment.

COMMENT

The negative findings at necropsy in patients suffering from cardiospasm, together with the experimental observations up to the present time, point to a neurogenic origin for this clinical entity. The presence of a true sphincter at the cardio-esophageal junction is necessary for this theory to be tenable. Knight believes that he has shown a true sphincter to be present in the cat.

The condition of cardiospasm, whether resulting from vagal failure or sympathetic overstimulation, theoretically should be relieved by sympathetic interruption.

It has been shown in our own patients that dilatation by the various methods will bring about symptomatic relief in a high percentage of cases, yet the delay in the esophagus is still present. The symptoms of cardiospasm characteristically recur following dilatation, and are usually relieved by further dilatation. There has been no adequate explanation for the symptomatic relief obtained by the use of dilators, without appreciable change in the x-ray appearance of the delay at the region of the cardio-esophageal junction.

CONCLUSION

The operation of interruption of the sympathetic fibers running to the lower end of the esophagus from the celiac plexus, as suggested by Knight, is recommended for consideration in those patients with cardiospasm not relieved by dilatation. All of the patients in our series were improved sufficiently by dilatation so that operative intervention was not required.

384 Post Street.

REFERENCES

1. Mosher, H. P.: Liver Tunnel and Cardiospasm, *Laryngoscope*, 32:348, 1922.
2. Jackson, C.: The Diaphragmatic Pinchcock in So-called Cardiospasm, *Laryngoscope*, 32:139, 1922.
3. Fulde, E.: Ueber die Anatomie und Physiologie des unteren Speiseröhrenabschnittes, *Deut. Zeitschr. f. Chir.*, 242:580, 1934.
4. Hurst, A. F.: Achalasia of Cardia (So-called Cardiospasm), *Quart. J. Med.*, 23:491, 1930.

5. Walton, A. J.: Surgical Treatment of Cardiospasm, *Brit. J. Surg.*, 12:701, 1924-1925.

6. Knight, G. C.: Sympathectomy in the Treatment of Achalasia of the Cardia, *Brit. J. Surg.*, 22:864, 1934-1935.

7. Ferguson, John H.: Effects of Vagotomy on the Gastric Functions of Monkeys, *Surg., Gyn., and Obs.*, 62:689, 1936.

DISCUSSION

F. P. O'HARA, M.D. (505 Medical-Dental Building, San Diego).—Most investigators consider cardiospasm to be due to some change in the nervous control over the esophagus. Many men have been seeking for some more adequate method of treatment than the dilatation of the cardia by mechanical means. Forcible dilatation no doubt relieves symptoms in a great number of these cases, but it has been found that these symptoms return and the actual deformity, as shown by x-ray, is unchanged. The work of Knight seems a definite step forward, and although it has not been tried in this country it deserves thoughtful consideration. We have found it difficult, so far, to persuade patients suffering from this condition to be operated upon, but think that time will soon make a change. It is a rather simple operative procedure, and its etiologic basis seems sound. Certainly, in some of the cases which have gone on for ten to twenty years, in spite of other forms of treatment, this procedure should seem advisable.

I have been particularly interested, not so much in cardiospasm, but in the "esophagismus" at other levels in the esophagus where we find spasm that will yield to simple repeated dilatation. In practically all of these cases it has been observed that there is a coexisting, rather localized arthritic spurring of the spine at the same level. Whether this condition may be stimulating the sympathetic innervation of the esophagus producing the spasm is merely conjecture, but I should be curious to know if other men have observed this same condition in cardiospasm.



JOHN HUNT SHEPARD, M.D. (608 Medico-Dental Building, San Jose).—The apparent infrequency with which a diagnosis of cardiospasm is made is, I believe, due to the fact that this clinical entity is not kept in the foreground of our minds. Some dysphasia is always present, and whenever a patient complains of dysphasia, substernal distress or discomfort in swallowing, or the eructation or vomiting of food free from any evidence of gastric digestion, an x-ray examination of the esophagus should be had, and if the roentgenologist is informed of the clinician's suspicion and uses a barium-acacia mixture in his examination, he will readily prove or disprove the presence of cardiospasm.

However, during the early stage, before dilatation of the esophagus has taken place, he may detect only a slight lagging of the barium column at the cardia, in which case subsequent examinations should be made. After dilatation or sacculization of the esophagus has taken place, the x-ray findings are most characteristic and only rarely can be misinterpreted. At times, dilatation of the esophagus may be so great that it will hold 1,000 cubic centimeters of material.

Symptomatic relief usually follows dilatation of the cardia, by the hydrostatic bag advocated by Plummer, the air bag as used by Smithies, or the large olive frequently used by Vinson. Doctor Stephens' experience in having to do multiple dilatations on the majority of his patients is not in conformity with the experience of several reported series. In the use of the hydrostatic or air bag, it is most advantageous to have one assuming a dumb-bell shape when completely distended, which prevents it from slipping out of the cardiac ring as it distends. The mid-portion of the dilating bag, when distended, should be an inch in diameter, and pressure of about 25 feet of water should be used. Unless dilatation is adequate, recurrences or incomplete relief is frequent. For the occasional case unrelieved by dilatation of the cardia, celiac sympathectomy should be done.

PANCREATIC SURGERY*

By GEORGE THOMASON, M.D.
Los Angeles

DISCUSSION by Walter A. Bayley, M.D., Los Angeles;
H. Clare Shepardson, M.D., San Francisco; Charles E. Phillips, M.D., Los Angeles.

GREAT interest has been revived during recent months in the matter of certain phases of pancreatic surgery. I refer especially to the condition now termed hyperinsulinism, or hypoglycemia, and to malignancy of the pancreas. It is to the consideration of these two features that this paper will be confined.

In hyperinsulinism and hypoglycemia we believe that pancreatic surgery promises to take its place as an added triumph in the successful conquest of this recently recognized surgical entity. While comparatively few cases have thus far been reported, certain features involved are being clarified and give great hopes for the future of increasingly more successful methods and technique for combating this type of pancreatic pathology.

In the light of quite recent developments, it is certainly within the range of possibility that the hitherto apparently hopeless condition of carcinoma of the pancreas may yet be brought under somewhat more successful surgical control.

EARLY STUDIES

Considering, first, hyperinsulinism and hypoglycemia: In 1920 Joslin noted spontaneous hypoglycemia in certain diabetic patients. Two years later Fletcher and Campbell outlined in detail the clinical features of an overdose of insulin; and in 1924 Seale Harris recorded his observation of this same feature in certain types of asthenic patients preceding the noon meal. To Wilder should go the greatest credit for his valuable contributions in the clarifying of this subject, in that he and his coworkers established the pathologic proof of the association between spontaneous hypoglycemia and hyperinsulinism.

WHEN SUGAR EQUILIBRIUM IS NOT MAINTAINED

Dysfunction of the pancreas with hypoinsulinism develops hyperglycemia. Dysfunction of the pancreas with hyperinsulinism develops hypoglycemia. In either case it is fundamentally a question of the maintenance of sugar equilibrium. In these cases it seems quite evident that the secretion of several glands is directly involved in the pathologic physiology. Insulin from the islands of Langerhans tends to diminish the amount of blood sugar. Secretions from the medulla of the adrenal glands, from the anterior lobe of the pituitary and from the thyroid gland, tend to increase it.

If the blood sugar falls below a critical point in consequence of a deficiency, splanchnic neurons of the sympathetic system are set in action, as indicated by increased adrenal secretion. Both the

* From the Surgical Department, College of Medical Evangelists, Los Angeles.

Read before the General Surgery Section of the California Medical Association at the sixty-fifth annual session, Coronado, May 25-28, 1936.